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Contrib.

ODD HYDROGEN IN THE ATMOSPHERES OF EARTH AND MARS

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The Martian atmosphere has many features in common with the terrestrial mesosphere. Both share similar pressure and temperature ranges, and much of the same chemistry operates in each. For example, the radical species H, OH, and HO_2, which comprise the odd hydrogen family, are of central importance in the catalytic destruction of CO and O_3 in both atmospheres.

The inclusion of recent chemical kinetics data, specifically temperature dependent CO_2 absorption cross-sections, into our one dimensional photochemical model of the Martian atmosphere shows that oxidation of CO by odd hydrogen is too efficient. 'l'he incorporation of smaller cross sections for CO_2 leads to an enhanced photolysis rate of water vapor, increasing odd hydrogen to the point where the predicted mixing ratio of CO in our model is substantially less than the observed value of $6{,}5 \times 10^{-4}$ [1]. Interestingly, most photochemical models of the terrestrial mesosphere underestimate the CO and O_3 densities using currently accepted photodissociation and kinetic rate coefficients (see, among others, [2-5]). This has also been attributed to an overabundance of odd hydrogen in the models.

We shall show that agreement between models and observations of CO in the Martian atmosphere as well as of CO and O_3 in the terrestrial mesosphere can be achieved by revising the rate constants for the reactions OH + HO_2 and CO + OH within their published uncertainties. The fact that similar revisions alleviate discrepancies in both the terrestrial and Martian atmospheres warrants a re-evaluation of these key rate constants at the appropriate temperatures and pressures.

REFERENCES: [1] Nair *et al.* (1994) Submitted to *Icarus*. [2] Allen *et al.* (1981) J. *Geophys. Res.*, 3617-3627. [3] Allen *et al.* (]9S4) ***J.*** *Geophys. Res.*, 4S41-4872. [4] Solomon *et al.* (1985) *J. Atmos. Sci.*, 1072 -10S3. [5] Clancy *et al.* (19S7) *J. Geophys. Res.*, 3067-3080.